I am not an ornithologist, only a farmer, but the habits of birds, insects, and animals have ever been a matter of interest to me. I have often watched them before a storm. While I can not recollect noticing the entire silence of birds for so long a time before a coming storm, they certainly do seem possessed of instinctive knowledge of coming storms. My observation leads me to say that parent birds are very active, and therefore too busy to sing, in providing food for their young often hours in advance of a storm. Nesting birds seem to hurry their work and make every possible preparation for the coming storm. You will scarcely ever see a wild bird on the wing after the storm breaks. While they do not sing, they frequently utter calls to their mates and "give orders." Some birds fly away out of the range of the storm.

Mr. W. C. Vandercook, crop reporter, Cherry Valley, Winnebago County, says:

When I was a boy an old hunter and trapper boarded in our family one winter. He often told how bluejays would yell and act excitedly before a hard blow, and often called our attention to the fact that there would be a hard wind within twenty-four hours, which invariably came to pass. It became so impressed on my mind that I often notice it and say to my family that there will be a hard wind because the jays are screaming. This is noticeable during the winter and spring more especially for the jay is a very quiet bird during the summer, hardly ever making a noise unless in defense of its young.

Mr. R. Williams, voluntary observer, Streator, Lasalle County, says:

I lived on a farm for twenty-five years, and during that period I can not recall an instance of so long an interval of silence before any visible sign of an approaching storm. Birds during the nesting season seem to sing more, just before a rain.

Mr. Charles A. Love, voluntary observer, Aurora, Kane County, says:

My father used to speak of the birds singing in an unusual manner in the mornings just before an ordinary rainstorm. Of course the air carries sound better during the quiet, early daylight just before a rain, for the air is saturated then; but I never heard of the birds not singing before an approaching storm. In the light of experiences which have been recorded in the WEATHER REVIEW, of the burning of kite wires in a clear sky by electricity, I can partially realize how the birds which fly high can discern the approach of a storm and seek refuge accordingly. The sensorium of the sweet singers at the surface may be so delicate that the approach of a welcome rain may be heralded forth by chirps and song, and before the awful scourge of hail and lightning stroke be warned away.

An investigation of our text books on meteorology fails to disclose any special comment on the subject of the effect of approaching storms upon birds. Admiral Fitz Roy says in his Weather Book:

Many animals and birds, most insects—even fishes—are acutely sensitive of changes in the air, which can only be accounted for readily by considerations of temperature, moisture, perhaps tension, and varying degrees of electricity.

A statement which is about as much on the subject as any of the writers give, most of them overlook it entirely.

A number of weather proverbs have been found which speak of the effect of approaching storms upon birds, but there are few in regard to our song birds, most of them being in regard to the flight or action of seagoing birds. I find a few, however, which seem to verify the observations of Mr. Warner, among these are the following:

When birds cease to sing, rain and thunder will probably occur.

If birds in general pick their feathers, wash themselves, and fly to their nests, expect rain.

It is said that parrots and canaries dress their feathers and are wakeful the evening before a storm.

If the peacock cries when he goes to roost, and, indeed, much at any time, it is a sign of rain.

Long and loud singing of robins in the morning denotes rain.

Robins will perch on the topmost branches of trees and whistle when a storm is approaching.

The restlessness of our domestic animals and barn yard fowls before an approaching storm is well known and many of their peculiarities have been noted, but I think this is the first time that the silence of song birds has been spoken of, and even more that they should be prophets of approaching storms is indeed a novel and interesting thing. That such is the fact, however, Mr. Warner's observations through many years and much travel, seem to verify.

PROGRESS IN THE EXPLORATION OF THE AIR WITH KITES AT THE BLUE HILL OBSERVATORY, MASSACHUSETTS.

By A. LAWRENCE ROTCH, Director.

(Read before Section B. A. A. A. S., Boston Meeting, August, 1898.)

Besides various brief accounts of the work at Blue Hill, a detailed description by Mr. Fergusson of the apparatus employed, with a discussion by Mr. Clayton of the meteorological results, until February, 1897, has been published this year as an Appendix to the Blue Hill observations for 1896, in Annals of the Astronomical Observatory of Harvard College, Vol. XLII, Part I.

Many improvements have been made in the apparatus, with the assistance of a grant from the Hodgkins fund of the Smithsonian Institution to obtain meteorological records at heights exceeding 10,000 feet. The single surface Eddy kite has been abandoned and the rectangular cellular form of Hargrave has been perfected by making it larger, more rigid, and relatively lighter, while by concaving the surfaces exposed to the wind the lifting power of the kite is increased. A recent kite of this type has a lifting surface of 90 square feet and weighs 11 pounds.[1] Mr. Lamson's folding aerocurve kite has superposed curved surfaces in front and superposed plane surfaces in the rear, each pair presenting a dihedral angle to the wind. This kite has attained the greatest height. In general, it may be said that our kites, with a short line, rise from 50° to 60° above the horizon and exert a traction of 1 pound per square foot of lifting surface in a wind blowing 20 miles an hour. Elastic bridles diminish the angle of incidence as the wind pressure increases, thereby enabling the kites to fly in gales.

The meteorographs made by M. Richard, in Paris, record three elements and weigh about 2.75 pounds, but one recently constructed by Mr. Fergusson, of the observatory staff, records barometric pressure, air temperature, relative humidity, and wind velocity, and yet weighs only 3 pounds with the aluminum case which protects the recording part from the weather. Much attention has been given to the exposure of the thermometer, and it is believed that the true temperature of the free air is now obtained whenever the meteorograph remains at nearly the same height during a few minutes.

The drum of the first steam windlass was crushed by the accumulated pressure of the coils of wire. A new steam windlass, with a strain pulley, constructed by Mr. Fergusson in 1897, on the principle of Sir William Thompson's deep-sea sounding apparatus has proved entirely successful. It has devices for measuring the length of wire uncoiled and continually recording its traction, and during the reeling in for automatically distributing it on the storage drum.

Since the use of wire in 1896, and with more efficient kites, the heights attained have been greatly increased. Thus the extreme heights of the meteorograph above the hill in all the flights prior to 1896 averaged about 1,000 feet, whereas its height during all the flights of the past three months was about 7,000 feet, and during the month of August, 1898, 7,800 feet. On five occasions the height of 10,000 feet has been exceeded, and on October 15, 1897, records were brought down from an altitude of 11,086 feet above the hill, which were printed in facsimile in the MONTHLY WEATHER REVIEW for September, 1897. The maximum height thus far attained was on August 26, 1898, when five kites, having a combined

[1] The standard size adopted for all Weather Bureau kite stations gives about 70 square feet of surface and weighs about 8 pounds. The Marvin meteorograph weighs about 2.1 pounds and records continuously wind velocity, barometric pressure, air temperature, and relative humidity. The apparatus was designed specially for daily ascensions up to 5,000 feet, at a regular time of day at numerous stations. Frequently 8,000 feet is attained, but higher flights are not sought for at present. The superiority of one large kite over a tandem of several small ones was early shown by Professor Marvin.—ED.

lifting surface of about 200 square feet, lifted 29,000 feet of wire weighing 75 pounds, and the meteorograph recording barometric pressure, air temperature and relative humidity, and wind velocity to the height of 11,444 feet above the hill. A maximum wind velocity of 40 miles an hour was encountered at a height of 11,000 feet, the surface wind being 22 miles an hour. The temperature at the highest point reached was 38° and the air was very dry, while at the ground at the same time the temperature of the air was 75° and its relative humidity 60 per cent. In September, 1897, the meteorograph was twice maintained at the nearly uniform height of 1,700 feet during the greater portion of twenty-four hours and flights were made on seven consecutive days. A discussion, by Mr. Clayton, of these records has been published as Bulletin No. 2 of the observatory under the title: Examples of the Diurnal and Cyclonic Changes of Temperature and Relative Humidity at Different Heights in the Free Air. In July, 1898, a practically continuous record at a greater altitude was obtained during a day and a night. Kites are frequently employed at Blue Hill to measure the heights of the lower surfaces of certain low and uniform clouds which could not be measured by either photographic or visual theodolites. By the traces of the barometer and hygrometer the thickness of clouds may be determined.

In conclusion, it may be affirmed that the Blue Hill experiments have demonstrated the possibilities of kites for the meteorological study of the free air up to a height of at least 2 miles above the earth.[1] The reasons for the superiority of kites over balloons, whenever there is wind, are stated by me in the Strassburg Aeronautische Mittheilungen for April, 1898. At the meeting of the International Aeronautical Committee in Strassburg last April I had the honor to present a report on the subject. The conference recommended that all the central observatories employ this method of investigation as being of prime importance for meteorology. (See MONTHLY WEATHER REVIEW, April, 1898.) At the present time kites are so employed at stations of the United States Weather Bureau, at St. Petersburg, and near Paris. Experiments with kites to obtain meteorological data are also being made in Scotland, the birth place of scientific kite flying, and a similar use of kites is proposed at some of the mountain meteorological stations on the continent of Europe, at the Deutsche Seewarte in Hamburg, and at the Prussian Meteorogical Institute in Berlin.

PROF. PARK MORRILL.

By Prof. E. B. GARRIOTT.

Park Morrill, Professor of Meteorology, United States Weather Bureau, died August 7, 1898, of typhoid fever, after an illness of three weeks.

Professor Morrill was born in Malden, Ill., in 1860; was graduated from Amherst College in 1881, and enlisted in the United States Signal Corps January 6, 1882. He was assigned to the Baltimore station of the Signal Service, August 8, 1882, for the purpose of pursuing a course of study at Johns Hopkins University for "the acquirement of an experimental and theoretical knowledge of those branches of physics that relate to meteorology, especially heat and electricity."

During the period of his assignment at Baltimore he was promoted to the rank of sergeant, to date July 12, 1885, and his detail at that place was terminated September 5, 1887. While serving as assistant at Boston, Mass., Mr. Morrill was ordered to assume charge of the Signal Service exhibit at the Paris Exposition, and in the performance of this duty he remained in Paris from March 25 to December 2, 1889. At the close of the exposition he returned to the Boston station. On July 1, 1891, he was appointed an observer in the Weather Bureau, and on October 2, 1891, was made local forecast official and placed in charge of the station at Atlanta, Ga., where he remained until September, 1894, when he was transferred to the Central Office, at Washington, for duty as forecast official, to which position he was appointed September 15, 1894. On July 16, 1898, he was made a professor of meteorology in the Weather Bureau and assigned to the charge of the establisment of the West Indian Weather Service.

Possessed of rare mental attainments which were developed by a college training, and ripened by five years of special study and investigation, Professor Morrill was eminently well equipped for a most useful and even brilliant career in his chosen field of work.

His ability and zeal in prosecuting work of a congenial nature was exemplified in the last year of his life. His work, Floods of the Mississippi, will long be considered a standard book of reference, and he will, for all time, be recognized as one of the first active workers in the organization of the West Indian Weather Service, a service which promises to prove of incalculable value to the maritime interests of the United States, the West Indies, and Central America.

Of a disposition generous and genial, he was beloved by those who knew him best. In his death the Weather Bureau loses one of its most gifted members, and the science of meteorology one of its most promising disciples.

THE PUBLISHED WORKS OF PROFESSOR MORRILL.

By the EDITOR.

In 1881 Gen. W. B. Hazen introduced new life into the service by securing the enlistment of young men of collegiate and scientific training. Mr. Morrill was among these and immediately after completing the course of instruction in signaling and meteorology at Fort Myer, Va., he was assigned to duty at the Johns Hopkins University for the purpose of maintaining a series of observations in atmospheric electricity under the special guidance of Prof. H. A. Rowland. The importance of this subject had been urged from a hygienic point of view by the American Climatological Association. A full account of his electrical work is given by Prof. T. C. Mendenhall, in his memoir of 1889, entitled A Report of Studies of Atmospheric Electricity, published in Volume V of the Memoirs of the National Academy of Sciences, Washington, 1891. Mr. Morrill's work at Baltimore included the establishment of a Mascart self-registering apparatus for atmospheric electricity, and he was the first to maintain such continuous record in this country; its importance was such that the complete record is published in the memoir by Mendenhall, pages 173–207. In 1878 Mr. Morrill was assigned to the station at Boston, and in that connection reestablished the Mascart apparatus at the Massachusetts Institute of Technology, where the record was maintained during the greater part of a year, until his departure for Paris. Mr. Morrill's work at Baltimore is highly spoken of in Professor Mendenhall's report. He, himself, published in Signal Service Note, No. 17, A first Report upon Observations upon Atmospheric Electricity at Baltimore. He also invented a mechanical collector to replace the Thompson water dropping collector, ordinarily used in connection with the Mascart apparatus, and which is fully described on pages 126 and 127 of Mendenhall's report. He

[1] The readers of the MONTHLY WEATHER REVIEW will scarcely need to be reminded that the works of A. Wilson, Ronalds and Birt, D. Archibald, William Eddy, A. McAdie, L. Hargrave, and others demonstrated the possibilities of kites for use in the study of meteorology of the free air at great heights some time before this work was taken up at Blue Hill. The employment of kites at the United States Weather Bureau stations was quite independent of the brilliant work done at Blue Hill or the recommendations of the International Committee. The advantages of kites over balloons are clearly stated by Prof. Willis L. Moore, Chief of the Weather Bureau, in Symons' Monthly Magazine for December, 1896, page 166.—ED.